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[54] **DOUBLE-SIDED CIRCUIT BOARD
EXPOSURE MACHINE AND METHOD
WITH OPTICAL REGISTRATION AND
MATERIAL VARIATION COMPENSATION**

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[52] **U.S. Cl.:** **356/401; 250/548; 355/53**

[58] **Field of Search** **355/53, 26, 89; 356/399, 400, 401; 250/548, 557**

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[57] ABSTRACT

A double-sided exposure apparatus with an optical registration system accurately aligns and prints a circuit pattern on both sides of a workpiece, such as a circuit board. The apparatus has a computer system in which setup parameters are entered to set the desired size of the board and accuracy of alignment. A control program of the computer directs a machine vision system to inspect the workpiece and pattern, and computes precision movements of the workpiece which compensate for any sag or other variations in the glass or board that change between off-contact and soft contact. The computer system uses fiducials on the two artworks and target holes on each board to align an artwork and the board prior to exposure. At least one inspection of the fiducials, and realignment of the workpiece, is performed after the pattern is in contact with the workpiece, to thereby compensate for workpiece warpage, variations, and sag or variations of the artwork holders. Alignment uses video cameras to detect the centers of the fiducials and target using a "best-fit" data processing method, which method includes compensation for any sag in the glass artwork holders.

26 Claims, 14 Drawing Sheets

Microfiche Appendix Included
(406 Microfiche, 7 Pages)

